

REMARKS

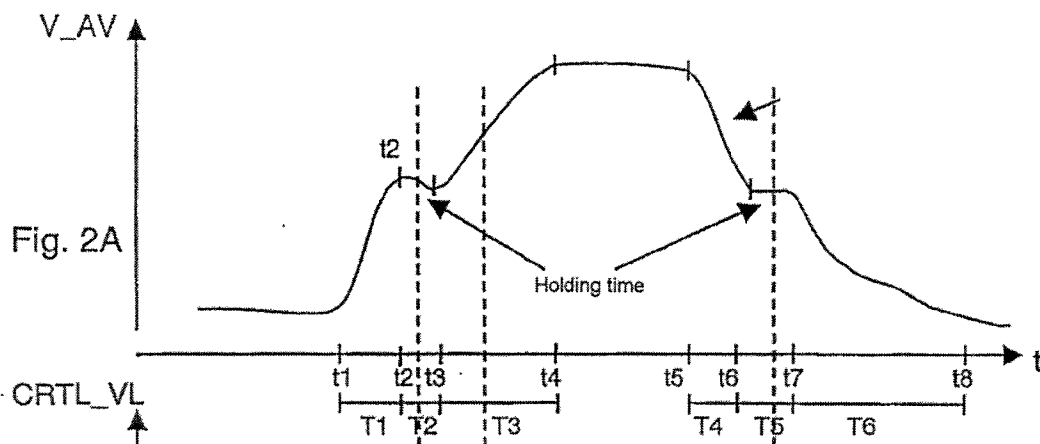
This Application has been carefully reviewed in light of the Final Office Action mailed March 17, 2009. At the time of the Final Office Action, Claims 1-20 were pending in this Application. Claims 1-20 were rejected. In view of its Request for Continued Examination and this Preliminary Amendment, Applicants respectfully request reconsideration and favorable action in this case.

Rejections under 35 U.S.C. § 102

Claims 1-6 and 14-18 stand rejected by the Examiner under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,057,734 issued to Naoyuki Tsuzuki et al. ("*Tsuzuki*"). Applicants respectfully traverse and submit the cited art does not teach all of the elements of the claimed embodiment of the invention.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). Furthermore, "the identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co. Ltd.*, 868 F.2d 1226, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989). Applicants respectfully submit that the cited art as anticipated by the Examiner cannot anticipate the rejected Claims, because the cited art does not show all the elements of the present Claims.

Tsuzuki fails to teach all claim elements because it does not teach a holding time duration between a first discharging duration and a second discharging duration. In particular, Claim 1 recites "dividing the **discharging process** into a **first discharging duration**, during which a predetermined first amount of electrical energy is discharged from the piezo actuator, a **subsequent holding time duration**, during which the piezo actuator is not controlled, and a **subsequent second discharging duration**, during which a predetermined second amount of electrical energy is discharged from the piezo actuator." (Claim 1)(emphasis added). Claim 14 also recites a holding time duration. A similar holding time duration is claim for a charging process in claim 2. Figure 2A shows a timing waveform for the piezo voltage.



(Spec at Figure 2A). With reference to Figure 2A, the specification teaches a holding duration T5 during discharging.

Firstly, the piezo actuator is discharged with a predetermined first amount of energy for a first discharging duration T4, and this actually takes place up to a point in time t6. Subsequent to this, the piezo actuator is not further discharged for a predetermined holding time duration T5, and this is actually up to a point in time t7. Subsequent to this, the piezo actuator is further discharged for a second discharging duration T6, during which a predetermined second amount of electrical energy is dissipated.

(Sub Spec at ¶[0033]). A similar holding time duration T2 is disclosed during the charging process. (Sub Spec at ¶[0032]). Thus, holding time durations, during which the piezo actuator is not controlled, are expressly recited in claims 1 and 2.

Alternatively, *Tsuzuki* discloses closing a valve by a two stage process, where the stages charge for predetermined time periods and there is no holding time duration between the two stages. First, *Tsuzuki* teaches a first charging stage. “Next, when the first-stage valve closing signal S₁ is generated, the thyristor 1051a is turned ON, so that an LC oscillation circuit is formed by the condenser 104a, the coil 1052, and the piezoelectric element 77.” (*Tsuzuki* at 12:39-42). *Tsuzuki* teaches that this first stage lasts for a

predetermine period of time and then the system immediately switches to the second stage. “Next, when a predetermined time such as 200 μ s has passed, so that the valve member 67d reaches the periphery of the valve seat 67b, the second-stage valve closing ignition signal S_1' is generated, to turn ON the thyristor 1051b.” (*Tsuzuki* at 12:66-13:2). The force applied by this second stage charge is maintained until the valve is opened. “In the above-mentioned state, after a predetermined time has passed, the valve opening ignition signal S_Q is generated.” (*Tsuzuki* at 13:22-23). Thus, *Tsuzuki* fails to teach or suggest a holding time duration. The invention as claimed in claims 1, 2 and 14 are not anticipated by *Tsuzuki*. The invention as claimed in claims 3-6 and 15-18 is patentable for similar reasons.

Because *Tsuzuki* fails to even mention a holding time duration, it fails to even suggest adapting a holding time duration, as claimed in the present claims. For example, claim 1 recites “dependent on the waveform of a voltage at the piezo actuator or a current through the piezo actuator which is characteristic of the oscillation behavior of the piezo actuator during the holding time duration, ***adapting the holding time duration and/or the first discharging duration in order to ensure precise control of the valve.***” (emphasis added). Similarly, but relative to a charging process, claim 2 recites “dependent on the waveform of a voltage at the piezo actuator or a current through the piezo actuator which is characteristic of the oscillation behavior of the piezo actuator during the holding time duration, ***adapting the holding time duration and/or the first charging duration in order to ensure precise control of the valve.***” (emphasis added). Claim 14 recites, “dependent on the waveform of a voltage at the piezo actuator or a current through the piezo actuator which is characteristic of the oscillation behavior of the piezo actuator during the holding time duration, ***means for adapting the holding time duration and/or the first charging duration in order to ensure precise control of the valve.***” (emphasis added)

According to the specification,

The holding time duration and/or the first discharging duration is/are adapted according to the waveform of a variable which is characteristic of the oscillation behavior of the piezo actuator during the holding time duration. By the means, pressure oscillations which occur as a result of the release of the valve seat in a fluid that is flowing through the valve can also easily be greatly dampened under different types of operating conditions of the valve. In addition, noise emissions can thus also be simply reduced.

The variable is preferably the amount of energy which is discharged from or fed to the piezo actuator, or the voltage which drops at the piezo actuator, or the current which flows through the piezo actuator, or the charge stored in it.

(Specification at ¶¶ 0009-0010). Alternatively, *Tsuzuki* teaches that the second stage begins immediately after the second stage and expressly teaches that the first stage lasts for a set time duration. In particular, it teaches that “when a ***predetermined time such as 200 μs has passed***, so that the valve member 67d reaches the periphery of the valve seat 67b, the second-stage valve closing ignition signal S₁' is generated, to turn ON the thyristor 1051b.” (*Tsuzuki* at 12:66-13:2). In the illustrative embodiment, *Tsuzuki* teaches that the first stage lasts for 200 μs and without any suggestion that this duration can be adapted or changed. Because *Tsuzuki* fails to teach or suggest varying the time of the first stage and does not even teach a holding time duration, much less varying a holding time duration, the invention as claimed in claims 1, 2 and 14 is patentable in view of *Tsuzuki*. The invention as claimed in claims 3-6 and 15-18 is patentable for similar reasons.

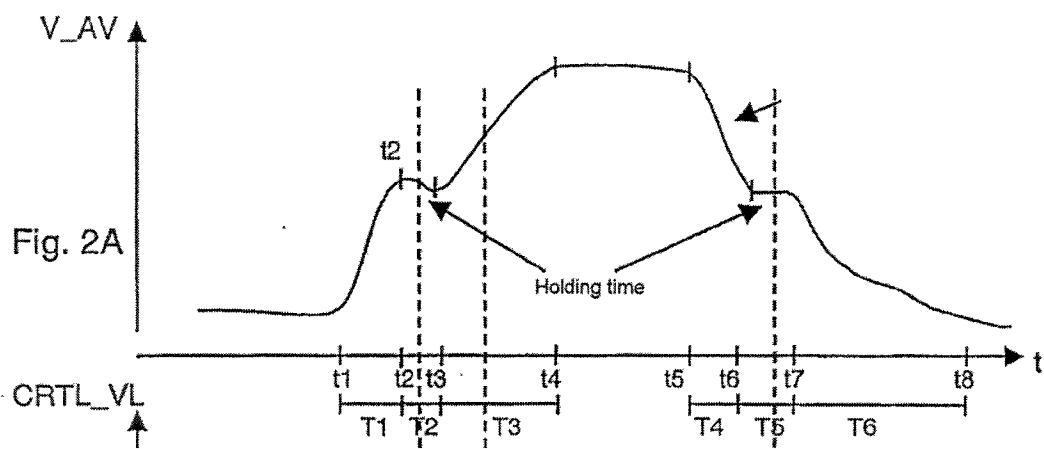
Rejections under 35 U.S.C. §103

Claims 7-13 and 19-20 were rejected under 35 U.S.C. §103(a) as being unpatentable over *Tsuzuki* in view of U.S. Patent Application Publication No. 2002/0113139 by Nestor Rodriguez-Amaya et al. (“*Rodriguez-Amaya*”). Applicants respectfully traverse and submit the cited art combinations, even if proper, which Applicants do not concede, does not render the claimed embodiment of the invention obvious.

In order to establish a prima facie case of obviousness, the references cited by the Examiner must disclose all claimed limitations. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Even if each limitation is disclosed in a combination of references, however, a claim composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. *KSR Int'l. Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007). Rather, the Examiner must identify an apparent reason to combine the known elements in the fashion claimed. *Id.* “Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal

conclusion of obviousness.” *Id.*, citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). Finally, the reason must be free of the distortion caused by hindsight bias and may not rely on ex post reasoning. *KSR*, 127 S.Ct. at 1742. In addition, evidence that such a combination was uniquely challenging or difficult tends to show that a claim was not obvious. *Leapfrog Enterprises, Inc. v. Fisher-Price, Inc. and Mattel, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007), citing *KSR*, 127 S.Ct. at 1741.

Tsuzuki fails to teach all claim elements because it does not teach a holding time duration between a first discharging duration and a second discharging duration. In particular, Claim 1 recites “dividing the **discharging process** into a **first discharging duration**, during which a predetermined first amount of electrical energy is discharged from the piezo actuator, a **subsequent holding time duration**, during which the piezo actuator is not controlled, and a **subsequent second discharging duration**, during which a predetermined second amount of electrical energy is discharged from the piezo actuator.” (Claim 1)(emphasis added). Claim 14 also recites a holding time duration. A similar holding time duration is claim for a charging process in claim 2. Figure 2A shows a timing waveform for the piezo voltage.



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Firstly, the piezo actuator is discharged with a predetermined first amount of energy for a first discharging duration T4, and this actually takes place up to a point in time t6. Subsequent to this, the piezo actuator is not further discharged for a predetermined holding time duration T5, and this is actually up to a point in time t7. Subsequent to this, the piezo actuator is further discharged for a second discharging duration T6, during which a predetermined second amount of electrical energy is dissipated.

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Alternatively, *Tsuzuki* discloses closing a valve by a two stage process, where the stages charge for predetermined time periods and there is no holding time duration between the two stages. First, *Tsuzuki* teaches a first charging stage. “Next, when the first-stage valve closing signal S₁ is generated, the thyristor 1051a is turned ON, so that an LC oscillation circuit is formed by the condenser 104a, the coil 1052, and the piezoelectric element 77.” (*Tsuzuki* at 12:39-42). *Tsuzuki* teaches that this first stage lasts for a predetermine period of time and then the system immediately switches to the second stage. “Next, when a predetermined time such as 200 μs has passed, so that the valve member 67d reaches the periphery of the valve seat 67b, the second-stage valve closing ignition signal S₁' is generated, to turn ON the thyristor 1051b.” (*Tsuzuki* at 12:66-13:2). The force applied by this second stage charge is maintained until the valve is opened. “In the above-mentioned state, after a predetermined time has passed, the valve opening ignition signal S_Q is generated.” (*Tsuzuki* at 13:22-23). Thus, *Tsuzuki* fails to teach or suggest a holding time duration. *Rodriguez-Amaya* also does not teach this feature. Thus, the invention as claimed in claim 7-13 and 19-20 is not obvious in view of *Tsuzuki* and *Rodriguez-Amaya*.

Because *Tsuzuki* fails to even mention a holding time duration, it fails to even suggest adapting a holding time duration, as claimed in the present claims. For example, claim 1 recites “dependent on the waveform of a voltage at the piezo actuator or a current through the piezo actuator which is characteristic of the oscillation behavior of the piezo actuator during the holding time duration, *adapting the holding time duration and/or the first discharging*

duration in order to ensure precise control of the valve.” (emphasis added). Similarly, but relative to a charging process, claim 2 recites “dependent on the waveform of a voltage at the piezo actuator or a current through the piezo actuator which is characteristic of the oscillation behavior of the piezo actuator during the holding time duration, *adapting the holding time duration and/or the first charging duration in order to ensure precise control of the valve.*” (emphasis added). Claim 14 recites, “dependent on the waveform of a voltage at the piezo actuator or a current through the piezo actuator which is characteristic of the oscillation behavior of the piezo actuator during the holding time duration, *means for adapting the holding time duration and/or the first charging duration in order to ensure precise control of the valve.*” (emphasis added)

According to the specification,

The holding time duration and/or the first discharging duration is/are adapted according to the waveform of a variable which is characteristic of the oscillation behavior of the piezo actuator during the holding time duration. By the means, pressure oscillations which occur as a result of the release of the valve seat in a fluid that is flowing through the valve can also easily be greatly dampened under different types of operating conditions of the valve. In addition, noise emissions can thus also be simply reduced.

The variable is preferably the amount of energy which is discharged from or fed to the piezo actuator, or the voltage which drops at the piezo actuator, or the current which flows through the piezo actuator, or the charge stored in it.

(Specification at ¶¶ 0009-0010). Alternatively, *Tsuzuki* teaches that the second stage begins immediately after the second stage and expressly teaches that the first stage lasts for a set time duration. In particular, it teaches that “when a *predetermined time such as 200 μs has passed*, so that the valve member 67d reaches the periphery of the valve seat 67b, the second-stage valve closing ignition signal S₁' is generated, to turn ON the thyristor 1051b.” (*Tsuzuki* at 12:66-13:2). In the illustrative embodiment, *Tsuzuki* teaches that the first stage lasts for 200 μs and without any suggestion that this duration can be adapted or changed. *Rodriguez-Amaya* also does not teach this feature. Because *Tsuzuki* and *Rodriguez-Amaya* fail to teach or suggest varying the time of the first stage and does not even teach a holding time duration, much less varying a holding time duration, the invention as claimed in claims 1, 2 and 14 is

patentable in view of *Tsuzuki* and *Rodriguez-Amaya*. The invention as claimed in claims 7-13 and 19-20 is patentable for similar reasons.

Association of Customer Number and Change of Correspondence Address

Applicants respectfully request that all papers pertaining to the above-captioned patent application be associated with Customer No. **86528**, and direct all correspondence pertaining to this patent application to practitioners at Customer Number **86528**. All telephone calls should be directed to R. William Beard, Jr. at 512.457.2026.

CONCLUSION

Applicants have made an earnest effort to place this case in condition for allowance in light of the remarks set forth above. Applicants respectfully request reconsideration of the pending claims.

Applicants believe there are no fees due at this time, however, the Commissioner is hereby authorized to charge any fees necessary or credit any overpayment to Deposit Account No. 50-4871 of King & Spalding L.L.P.

If there are any matters concerning this Application that may be cleared up in a telephone conversation, please contact Applicants' attorney at 512.457.2026.

Respectfully submitted,
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Date: August 20, 2009

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